WHAT IS CLAIMED IS:

1. A substrate comprising a surface and a polymer, the polymer coating at least a portion of and being coupled to the surface;

the polymer comprising:

at least about 40 mol-% N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof;

one or more pendant reactive groups configured to form covalent bond with biomolecule.

2. The substrate of claim 1, wherein the polymer comprises N,N-dimethylacrylamide, N,N-diethylacrylamide, N-isopropylacrylamide, N-t-butylacrylamide, N-octylacrylamide, N-cyclohexylacrylamide, N-phenylacrylamide, N-benzylacrylamide, N-($CH_2OC_4H_9$)acrylamide, N-(CH_2CH_2OH)acrylamide, N-(CH_2OH)acrylamide, N-($CH_2CH_2CH_2OH$)acrylamide, N-methylmethacrylamide, N-ethylmethacrylamide, N,N-dimethylmethacrylamide, N,N-diethylmethacrylamide, N-acryloylmorpholine, N-methacryloylmorpholine, N-($CH_2OC_4H_9$)methacrylamide, N-(CH_2CH_2OH)methacrylamide, N-(CH_2OH)methacrylamide, or mixtures thereof.

3. The substrate of claim 2, wherein the polymer comprises N,N-dimethylacrylamide.

4. The substrate of claim 1, wherein the polymer comprises about 85 to about 95 mol-% N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof.

5. The substrate of claim 1, wherein the polymer coating comprises an N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof in an amount effective to provide a contact angle of about 30° to about 60° for a sessile water drop.

6. The substrate of claim 1, wherein the one or more reactive groups comprise thermochemically reactive group, photochemically reactive group, or mixtures thereof.

7. The substrate of claim 6, wherein the one or more reactive groups comprise thermochemically reactive group; the thermochemically reactive group comprising NOS, epoxide, aldehyde, isothiocyanate, or mixtures thereof.

8. The substrate of claim 6, wherein the one or more reactive groups comprise photochemically reactive group; the photochemically reactive group comprising acetophenone, benzophenone, quinone, anthraquinone, anthrone, heterocyclic analog of anthrone, or mixtures thereof.

9. The substrate of claim 6, wherein the one or more reactive groups comprise photochemically reactive group; the photochemically reactive group comprises photoreactive aryl ketone; and the biomolecule comprises nucleic acid.

10. The substrate of claim 1, wherein the substrate comprises activated slide.

11. The substrate of claim 10, wherein
the slide is configured for fabricating microarray;
the biomolecule comprises nucleic acid; and
the surface comprises the surface of plastic, silicon hydride, or organosilane-pretreated glass or silicon slide.

12. The substrate of claim 10, wherein the slide is configured to receive sample in an amount of twenty nanoliters or less.

13. The substrate of claim 1, wherein the biomolecule comprises polypeptide or nucleic acid.

14. The substrate of claim 13, wherein the biomolecule comprises nucleic acid and the nucleic acid comprises amine group, sulfhydryl group, or mixture thereof.

15. A substrate comprising:

support surface; and

polymer coupled to the support surface;

the polymer comprising:

at least about 40 mol-% N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof; and

one or more reactive groups;

wherein the polymer is configured to form covalent bonds with biomolecule.

16. A composition comprising polymer;

the polymer comprising:

at least about 40 mol-% N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof; and

one or more reactive groups configured to form covalent bonds with corresponding functional groups on biomolecule;

the polymer being configured to be covalently attached to surface.

17. The composition of claim 16, wherein the polymer comprises N,N-dimethylacrylamide, N,N-diethylacrylamide, N-isopropylacrylamide, N-t-butylacrylamide, N-octylacrylamide, N-cyclohexylacrylamide, N-phenylacrylamide, N-benzylacrylamide, N-($CH_2OC_4H_9$)acrylamide, N-(CH_2CH_2OH)acrylamide, N-(CH_2OH)acrylamide, N-($CH_2CH_2CH_2OH$)acrylamide, N-methylmethacrylamide, N-ethylmethacrylamide, N,N-dimethylmethacrylamide, N,N-diethylmethacrylamide, N-acryloylmorpholine, N-methacryloylmorpholine, N-($CH_2OC_4H_9$)methacrylamide, N-(CH_2CH_2OH)methacrylamide, N-(CH_2OH)methacrylamide, or mixtures thereof.

18. The composition of claim 17, wherein the polymer comprises N,N-dimethylacrylamide.

19. The composition of claim 16, wherein the polymer comprises about 85 to about 95 mol-% N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof.

20. The composition of claim 16, wherein the polymer coating comprises an N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof in an amount effective to provide, when coated on a surface of a substrate, a contact angle of about 30° to about 60° for a sessile water drop.

21. The composition of claim 16, wherein the one or more reactive groups comprise thermochemically reactive group, photochemically reactive group, or mixtures thereof.

22. The composition of claim 21, wherein the one or more reactive groups comprise thermochemically reactive group; the thermochemically reactive group comprising NOS, epoxide, aldehyde, isothiocyanate, or mixtures thereof.

23. The composition of claim 21, wherein the one or more reactive groups comprise photochemically reactive group; the photochemically reactive group comprising acetophenone, benzophenone, quinone, anthraquinone, anthrone, heterocyclic analog of anthrone, or mixtures thereof.

24. The composition of claim 21, wherein the one or more reactive groups comprise photochemically reactive group; the photochemically reactive group comprises photoreactive aryl ketone; and the biomolecule comprises nucleic acid.

25. The composition of claim 16, wherein:

the biomolecule comprises nucleic acid; and

the surface comprises organosilane-pretreated glass, organosilane-pretreated silicon, silicon hydride, or plastic.

26. A method of attaching biomolecule to surface of substrate, the method comprising:

providing composition comprising polymer;

the polymer comprising:

at least about 40 mol-% N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof; and

one or more pendent reactive groups configured to form covalent bonds with corresponding functional groups on biomolecule;

the polymer being configured to be covalently attached to the surface

coating and immobilizing the composition on the substrate surface;

providing solution comprising biomolecule comprising one or more functional groups reactive with the reactive groups;

applying an aliquot of the solution to the substrate surface; and

forming covalent bonds between the reactive group and the functional group of the biomolecule.

27. A microarray comprising:

support surface;

polymer covalently coupled to the support surface;

the polymer comprising:

at least about 40 mol-% N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof; and

one or more reactive groups;

biomolecule covalently bound to the polymer in discrete spots.

28. The microarray of claim 27, wherein the spots are generally circular in shape, have a diameter of about 20 microns to about 100 microns, and are separated from other spots in the array by center to center spacing of about 40 microns to about 120 microns.

29. The microarray of claim 27, wherein the polymer coating comprises an N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof in an amount effective to provide a contact angle of about 30° to about 60° for a sessile water drop.

30. A substrate comprising a surface and a polymer, the polymer coating at least a portion of the surface;

the polymer comprising:

at least about 40 mol-% of monomer comprising an uncharged polar moiety other than primary amide; and

one or more pendent reactive groups configured to form covalent bond with biomolecule.

31. The substrate of claim 30, wherein the polymer comprises:

N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof;

hydroxyalkylacrylate, hydroxyalkylmethacrylate, alkyl or aryl acrylate, alkyl or aryl methacrylate, ethoxyethoxyethylacrylate, polypropyleneglycolmonomethacrylate, or mixtures thereof;

vinylpyrrolidone, vinylcaprolactam, N-vinyl-N-methylacetamide, vinylmethylether, 2-vinylpyridine-N-oxide, vinylmethylsulfone, or mixtures thereof;

ethyleneglycol, ethyleneimine, PEG derivative of monomethacrylate, or mixtures thereof;

aminimide; or

mixtures thereof.

32. A substrate comprising:

support surface; and

polymer coupled to the support surface; the polymer comprising:

at least about 40 mol-% of monomer comprising an uncharged polar moiety other than primary amide; and

more than one reactive group;

wherein the polymer is configured to form covalent bonds with biomolecule.

33. A composition comprising polymer;

the polymer comprising:

at least about 40 mol-% of monomer comprising an uncharged polar moiety other than primary amide; and

one or more reactive groups configured to form covalent bonds with corresponding functional groups on biomolecule;

the polymer being configured to be covalently attached to surface.

34. The composition of claim 33, wherein the polymer comprises:

N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof;

hydroxyalkylacrylate, hydroxyalkylmethacrylate, alkyl or aryl acrylate, alkyl or aryl methacrylate, ethoxyethoxyethylacrylate, polypropyleneglycolmonomethacrylate, or mixtures thereof;

vinylpyrrolidone, vinylcaprolactam, N-vinyl-N-methylacetamide, vinylmethylether, 2-vinylpyridine-N-oxide, vinylmethylsulfone, or mixtures thereof;

ethyleneglycol, ethyleneimine, PEG derivative of monomethacrylate, or mixtures thereof;

aminimide; or

mixtures thereof.

35. The composition of claim 33, wherein the polymer coating comprises a monomer comprising an uncharged polar moiety other than primary amide in an amount

effective to provide, when coated on a surface of a substrate, a contact angle of about 30° to about 60° for a sessile water drop.

36. A method of attaching biomolecule to surface of substrate, the method comprising:

providing composition comprising polymer; the polymer comprising:

at least about 40 mol-% of monomer comprising an uncharged polar moiety other than primary amide; and

one or more pendent reactive groups configured to form covalent bonds with corresponding functional groups on biomolecule;

the polymer being configured to be covalently attached to the surface;

coating and immobilizing the composition on the substrate surface;

providing solution comprising biomolecule comprising one or more functional groups reactive with the reactive groups;

applying an aliquot of the solution on the substrate surface; and

forming covalent bonds between the reactive group and the functional group of the biomolecule.

37. The method of claim 36, wherein the polymer comprises:

N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof;

hydroxyalkylacrylate, hydroxyalkylmethacrylate, alkyl or aryl acrylate, alkyl or aryl methacrylate, ethoxyethoxyethylacrylate, polypropyleneglycolmonomethacrylate, or mixtures thereof;

vinylpyrrolidone, vinylcaprolactam, N-vinyl-N-methylacetamide, vinylmethylether, 2-vinylpyridine-N-oxide, vinylmethylsulfone, or mixtures thereof;

ethyleneglycol, ethyleneimine, PEG derivative of monomethacrylate, or mixtures thereof;

aminimide; or

mixtures thereof.

38. The method of claim 36, wherein the polymer coating comprises a monomer comprising an uncharged polar moiety other than primary amide in an amount effective to provide a contact angle of about 30° to about 60° for a sessile water drop.

39. A microarray comprising:

support surface;

polymer covalently coupled to the support surface;

the polymer comprising:

at least about 40 mol-% of monomer comprising an uncharged polar moiety other than primary amide; and

one or more reactive groups;

biomolecule covalently bound to the polymer in discrete spots.

40. The microarray of claim 39, wherein the polymer comprises:

N-substituted acrylamide, N,N-disubstituted acrylamide, N-substituted methacrylamide, N,N-disubstituted methacrylamide, or mixture thereof;

hydroxyalkylacrylate, hydroxyalkylmethacrylate, alkyl or aryl acrylate, alkyl or aryl methacrylate, ethoxyethoxyethylacrylate, polypropyleneglycolmonomethacrylate, or mixtures thereof;

vinylpyrrolidone, vinylcaprolactam, N-vinyl-N-methylacetamide, vinylmethylether, 2-vinylpyridine-N-oxide, vinylmethylsulfone, or mixtures thereof;

ethyleneglycol, ethyleneimine, PEG derivative of monomethacrylate, or mixtures thereof;

aminimide; or

mixtures thereof.

41. The microarray of claim 39, wherein the polymer coating comprises a monomer comprising an uncharged polar moiety other than primary amide in an amount effective to provide a contact angle of about 30° to about 60° for a sessile water drop.

42. A substrate comprising a surface and a polymer, the polymer coating at least a portion of the surface;

the polymer comprising:

an amount of monomer comprising an uncharged polar moiety other than primary amide effective to provide a contact angle of about 30° to about 60° for a sessile water drop; and

one or more pendent reactive groups configured to form covalent bond with biomolecule.

43. A composition comprising polymer;

the polymer comprising:

a quantity of monomer comprising an uncharged polar moiety other than primary amide effective to provide, when coated on a surface, a contact angle of about 30° to about 60° for a sessile water drop; and

one or more reactive groups configured to form covalent bonds with corresponding functional groups on biomolecule;

the polymer being configured to be covalently attached to surface.

44. A method of attaching biomolecule to surface of substrate, the method comprising:

providing composition comprising polymer; the polymer comprising:

an amount of monomer comprising an uncharged polar moiety other than primary amide effective to provide a contact angle of about 30° to about 60° for a sessile water drop; and

one or more pendent reactive groups configured to form covalent bonds with corresponding functional groups on biomolecule;

the polymer being configured to be covalently attached to the surface

coating and immobilizing the composition on the substrate surface;

providing solution comprising biomolecule comprising one or more functional groups reactive with the reactive groups;

applying an aliquot of the solution on the substrate surface; and

forming covalent bonds between the reactive group and the functional group of the biomolecule.

45. A microarray comprising:

support surface;

polymer covalently coupled to the support surface;

the polymer comprising:

an amount of monomer comprising an uncharged polar moiety other than primary amide effective to provide a contact angle of about 30° to about 60° for a sessile water drop; and

one or more reactive groups;

biomolecule covalently bound to the polymer in discrete spots.